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Establishing Verbal Repertoires: Toward the Application of General Case Analysis and Programming

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A great deal of clinical and experimental work in past decades has focused on establishing functional verbal repertoires that are used across various settings and situations by persons with moderate and severe disabilities. Such work has not always involved a careful analysis and programming approach for structuring training to achieve the desired range of stimulus control relationships. General case analysis and programming procedures, which are based on behavior analytic and Direct Instruction principles and techniques, have proven effective in recent years for teaching a variety of community-based skills to learners with moderate and severe disabilities. This paper outlines the general case process and discusses its application to establish verbal repertoires.

Children, adolescents, and adults with moderate and severe developmental disabilities (i.e., who are labeled as having autism, mental retardation, etc.) often evidence significant problems with interactive verbal skills (Calculator & Bedrosian, 1988; Miller, Yoder, & Schiefelbusch, 1983; Sundberg, 1983, 1987; Warren & Rogers-Warren, 1985; Watson, Lord, Schaffer, & Schopler, 1989). Such problems encompass many aspects of verbal behavior, including producing and responding appropriately to mand, tact, intraverbal, and autoclitic repertoires. Given that interpersonal and community functioning is so dependent on such verbal repertoires, it is no surprise that establishing verbal behavior in persons with disabilities has received so much clinical and experimental attention. This emphasis has increased in recent years with the growing recognition and empirical demonstration that persons with disabilities who lack acceptable verbal repertoires may often engage in difficult behaviors (e.g., self-injury, aggression, property destruction) to achieve verbal functions (Carr, 1988; Carr & Durand, 1985; Durand, Crimmins, Caulfield, & Taylor, 1989; Doss & Reichle, 1989; Horner, Sprague, O'Brien, & Heathfield, 1990; Michael, 1988; Sundberg, 1983, 1987).

This paper has four purposes: (a) to briefly review and compare two major lines of research which have focused on establishing verbal repertoires in persons with disabilities; (b) to briefly discuss some of the major outcomes still to be achieved with such approaches; (c) to outline the characteristics of the general case approach to programming; and, (d) to discuss the application of general case analysis and programming procedures to the establishment of verbal repertoires.

ESTABLISHMENT OF VERBAL REPERTOIRES IN PERSONS WITH DISABILITIES

Much of the initial and current clinical and experimental efforts in this area have been based on straightforward operant or

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applied behavior analysis training approaches (Lovaas, 1977; Michael, 1984; Warren & Rogers-Warren, 1985). Such approaches have often focused on very structured methods, sometimes employing one-to-one training in limited stimulus contexts with various powerful reinforcers. Early studies often focused on establishment of what would be classified, according to Skinner (1957), as basic echoic, tact, and intraverbal responses (Lovaas, Berberich, Perloff, & Schaeffer, 1966; Risley & Wolf, 1966). For example, in some studies learners were taught to imitate vocal responses presented by trainers (e.g., "Say dog," "Say Bill"). These echoic responses were then sometimes brought under the control of intraverbal or tact contingencies (e.g., saying "What's your name?", or "What is this?" while holding up a picture). While not specifically based on Skinner's analysis and classification of verbal behavior, a large variety of subsequent work has involved the successful training of more complex tacting, manding, and intraverbal repertoires in a variety of more natural settings and situations (see Lovaas, 1977; Schopler & Mesibov, 1985; Warren & Kaiser, 1986; and Warren & Rogers-Warren, 1985 for reviews).

Another line of research has been carried out specifically based on Skinner's (1957) analysis of verbal behavior. These studies have focused on establishing relationships between a variety of verbal responses and appropriate controlling variables. Manding responses have often been trained with functionally similar procedures which have received different labels, including the interrupted behavior chain strategy (Alwell, Hunt, Goetz, & Sailor, 1989; Hunt & Goetz, 1988), the manipulation of conditioned establishing operations (Hall & Sundberg, 1987; Sigafoos, Doss, & Reichle, 1989; Sundberg, 1983), and blocked-response CEO's (Michael, 1988). The basic procedure involves establishing a chain of responses which lead to a particular outcome or effective reinforcer, and then blocking or preventing the person's ability to complete a step in the chain. This sets the occasion for a reinforceable mand. Other strategies for mand training have included the presence of already established reinforcers to evoke mand responses (see Oah & Dickinson, 1989, for a review).

Tacting responses have often been trained as a part of studies attempting to demonstrate the independence of different verbal repertoires. For example, Hall and Sundberg (1987), Lamarre and Holland (1985), and Sigafoos, Reichle, Doss, Hall, and Pettitt (1990) have demonstrated that responses acquired under tact contingencies will not always be demonstrated under appropriate mand contingencies, at least without prior development of a minimal mand repertoire (Sigafoos et al., 1990) (see Oah & Dickinson, 1989, for further review). Other studies have focused on transferring control of echoic and tact responses to other contingencies, in order to develop basic intraverbal repertoires (Braam & Poling, 1983; Luciano, 1986; Watkins, Pack-Teixteira, & Howard, 1989). More detailed reviews of this literature and examples of relevant training procedures can be found in Oah and Dickinson (1989) and Sundberg (1987).

Establishing Performance Across Untrained Stimulus Conditions

The two types of training approaches briefly reviewed above have often achieved very impressive results, especially considering the complexity of the subject matter. However, many clinicians and researchers have noted that there is still progress to be made in a variety of areas. Perhaps chief among these is facilitating the display of trained (and sometimes untrained) responses in a functional manner in settings and situations and with persons that were not part of the original training environment(s) (Costello, 1983; Halle & Holt, in press). Such outcomes have typically been considered under the headings of stimulus and response generalization (Warren, 1988). Problems in achieving such outcomes have often been attributed to two major variables: (a) the *context* of training, and (b) the *content* of training, in terms of the types of verbal operants that were trained (e.g., tacts vs.

mands). Instructional methods have sometimes included limited contexts and setting conditions. As a result, persons have not been trained to respond to the type and variety of stimuli and controlling conditions found in their typical non-training environments (Halle, 1982, 1987). There has also been greater recognition of the need to establish responses and controlling relationships (e.g., mands) which will be more functional in typical environments by resulting in specifically reinforcing outcomes for the learner (Goetz & Sailor, 1988; Michael, 1988; Sundberg, 1987). In assessing both strands of verbal behavior research, it is possible to see both similar and different perspectives which bear on such issues.

Specification of verbal operants. One area of difference concerns the specification and training of particular verbal operants and their controlling variables. Research based on Skinner's (1957) analysis has attempted to establish and analyze controlling relationships which define mand, tact, and intraverbal responses (Stafford, Sundberg, & Braam, 1988). Applied behavior analytic research has not always carefully attended to such issues, which may have implications for the definition and assessment of generalized performance. For example, in a recent study, Matson, Sevin, Fridley, and Love (1990) taught three students labelled as autistic to request items (" , please"), and to say "Thank you" and "You're welcome" upon receiving or giving items to another person. The investigators used objects and echoic prompts to evoke request responses ("_____, please"). However, such responses received both specific (i.e., the object requested) and nonspecific (i.e., edibles, verbal praise) consequences. Given that the responses had previously been exhibited under tact contingencies, such a format might make it difficult to determine what types of controlling relationships were being trained (e.g., tacts, "impure" mands [Oah & Dickinson, 1989]). This would have implications for analyzing why the trained responses might or might not be performed under conditions that differed from training.

A study by Romski, Sevcik, and Pate (1988) illustrates a similar concern. They trained learners with mental retardation to select lexigrams on a computer keyboard to mand food items. During training they periodically assessed the learners' ability to tact the items and select them when given the verbal labels. After substantial mand training with a variety of food and other objects, 3 of 4 learners demonstrated appropriate tacting and selecting responses. This was interpreted by the authors as evidence of generalization. While other research has demonstrated that responses learned under one type of contingency may be displayed under other types without direct training (Sigafoos, Doss, & Reichle, 1989; Sigafoos et al., 1990), it would seem important to be aware of the potentially independent controlling variables and relationships, which may affect responding under different conditions. It may not be reasonable to expect such "generalization" in all instances, particularly early in a training sequence.

Performance across contexts. An area of similarity between the two types of verbal behavior research is an interest in performance of verbal responses across similar and different contexts or stimulus classes (e.g., objects, people, places, activities). For example, in the study by Matson et al., (1990) described above, stimulus generalization was assessed by presenting students with other items which they could tact but which had not been involved in the training activities. All of the participants exhibited the trained responses during interactions involving these items. Similarly, Foxx, Faw, McMorrow, Kyle, and Bittle (1988) worked with three learners with mental retardation in attempting to establish responses to questions, where the responses typically involved labeling objects in the environment. Generalization was assessed by having a novel person ask the target questions in both training and novel settings (new room). The results indicated varying levels of successful performance under these conditions. (In rela-

tion to the point made above, it is worth noting that a lack of generalized performance may have been due in part to changes in controlling variables; during training sessions learners had objects available to label [tact contingencies], while in some generalization settings there were no objects when questions were asked [more purely intraverbal contingencies]).

Other applied behavior analytic approaches have been developed for bringing more functional verbal behavior under the control of a range of stimuli and settings. These approaches have included using multiple varied stimuli and settings during training (Handelman, 1979, 1981), using time delay techniques to bring persons under the control of stimuli other than instructional prompts (e.g., cookies vs. "Say 'I want cookie'") (Halle, Baer, & Spradlin, 1981; Charlop, Schreibman, & Thibodeau, 1985), and milieu language training procedures (Warren & Bambara, 1989). Such techniques have often resulted in more spontaneous verbal performance in particular settings (Koegel, O'Dell, & Koegel, 1987).

Research based upon Skinner's analysis of verbal behavior has investigated similar issues. For example, Hall and Sundberg (1987) trained learners to mand items needed to complete response chains leading to desired outcomes (e.g., drinking soda, eating soup). Their results demonstrated that learners would sometimes emit trained mands during untrained response chains (i.e., novel stimuli), and vice versa. Similar results were reported by Sigafoos, Doss, and Reichle (1989) and Sigafoos et al., (1990).

Both types of verbal behavior research have been concerned with and have succeeded in establishing performance across stimulus conditions that were not specifically involved in training. However, in much of the research assessment outside of training conditions is often limited to one or a few socially relevant situations and settings (Halle & Holt, in press). While progress continues to be made, it would seem useful to develop more comprehensive approaches to analyzing and assessing such conditions. What is needed is a strategy for more careful analysis and specification of the full range of controlling variables that should set the occasion for verbal responding. This would include people, objects, and physical settings, as well as relevant motivative variables (establishing operations). Such an analysis is needed before training begins, so that it can guide the selection of conditions to be presented during training. Without such an analysis the outcomes may continue to be a lack of desired performance across settings and situations. Given that research has demonstrated that persons with disabilities may have difficulty in coming under control of and responding to complex environmental stimulation in the desired fashion (Lovaas, Koegel, & Schreibman, 1979), careful consideration of how stimuli and setting conditions are chosen and presented takes on critical importance.

One approach for analyzing, choosing, and presenting stimulus conditions during training that has been undergoing significant development in recent years is the general case model. This model will be more fully described below, and the general case process will be outlined with regard to its potential specific application to teaching verbal behavior.

THE GENERAL CASE MODEL

Basis in Direct Instruction

The general case model is based on principles and procedures developed in Direct Instruction (Becker, Engelmann, & Thomas, 1975). This approach to teaching places great emphasis on careful analysis of the stimulus features of particular tasks and skills, and how they are selected and presented to learners in instructional sequences. The goal is to facilitate appropriate discriminations and responding to stimuli which share common features, and not responding to irrelevant features which may vary across stimuli and settings (Engelmann & Carnine, 1982). In Direct Instruction there has been a strong focus on teaching the general case (Alessi, 1987).

General case programming involves bringing appropriate classes of responses under the control of appropriate classes of stimuli, in order to increase the probability that skills learned in particular settings will be successfully performed with stimuli or in settings that were not directly involved in training (Becker, 1986; Becker & Engelmann, 1978). The goal is for persons to acquire and perform behaviors across all appropriate stimulus conditions, while not performing these behaviors under inappropriate conditions (Horner, Bellamy, & Colvin, 1984).

One sometimes subtle conceptual advantage of this approach is that generalized performance is viewed as the result of the establishment of the full range of desired stimulus control over when and when not to respond. Typical terminology and discussions often refer to *persons* and *behavior* as generalizing. From the general case perspective it is the established range of *stimulus control relationships* that lead to generalized (and maintained) performance. This viewpoint leads to a greater focus on understanding and arranging the environmental and training variables which lead to the desired outcomes, as opposed to viewing generalized performance as resulting from some characteristics of the learner or the behaviors of interest.

It is important to emphasize that the general case model plans for and programs generalized responding from the beginning of training. Performance is not trained to a particular criterion in a particular situation, and then shifted to varying contexts. Performance across the range of desired conditions is the focus beginning with the initial teaching sequences.

Applications to Persons With Severe Disabilities

Over the last decade the general case model has been applied to instruction of persons with severe disabilities (Horner & Albin, 1988; Horner, Sprague, & Wilcox, 1982). The primary emphasis to date has been on teaching a variety of functional community-based skills to adolescents and adults with severe disabilities. These skills have included grocery purchasing (McDonnell, Horner, & Williams, 1984), dressing skills (Day & Horner, 1986), telephone use (Horner, Williams, & Stevely, 1987), fast-food restaurant skills (Steere, Strauch, Powell, & Butterworth, 1990), street crossing (Horner, Jones, & Williams, 1985), vending machine use (Sprague & Horner, 1984), and electronic assembly tasks (Horner & McDonald, 1982). The general case emphasis on careful analysis and selection of stimuli and settings used in training has resulted in a technology for successfully achieving generalized performance of these types of skills by persons with severe disabilities. In a recent comprehensive review and quantitative analysis of the generalization literature, White et al., (1988) concluded that "It would appear, on the basis of admittedly limited evidence, that general case programming is the strategy of choice for facilitating generalization from instructional to applied situations" (p. 39).

THE GENERAL CASE PROCESS: APPLICATION TO VERBAL BEHAVIOR

The steps in the process are listed in Table 1 and are discussed below with regard to their potential application to establishing verbal repertoires.

Table 1

Steps in the general case analysis and programming process (adapted from Horner & Albin, 1988; Horner, McDonnell, & Bellamy, 1986; Horner, Sprague, & Wilcox, 1982).

Step One:	Defining the Instructional Universe
Step Two:	Defining the Range of Relevant Stimulus and Response Variation
Step Three:	Selecting Examples for Teaching and Testing
Step Four:	Sequencing Teaching Examples
Step Five:	Teaching the Examples
Step Six:	Testing with Nontrained Probe Examples

Defining the Instructional Universe

This first step involves explicitly defining the set of stimulus conditions across which the specified behaviors are to be performed. The instructional universe

refers to all the stimulus situations in which a person would be expected to perform a skill to achieve a particular outcome (Horner, McDonnell, & Bellamy, 1986). For example, a student being trained to purchase groceries may have an instructional universe ranging from "all food items in all stores in town," or "any food item in one store close to home," or "any dairy item in the store by his/her home" (Horner, McDonnell, & Bellamy, 1986). The specification of the universe determines the range of stimulus and response variation that will be encountered by the learner (see below).

Defining such a universe is relatively less challenging when considering target skills such as use of vending machines, street crossing, and bus riding, as opposed to functional verbal behavior. The range of relevant vending machines or street crossing situations can be relatively well specified. In contrast, if a teacher or trainer wishes to establish a manding repertoire, the type and range of relevant and irrelevant stimulus situations and characteristics could be extremely varied, including different persons, settings, activities, and objects/materials (e.g., "all situations in which food items and persons are present," "all situations in which toys and peers are present"). In addition, there is the need to consider motivative variables (conditioned and unconditioned establishing operations) that may be in effect that will set the occasion for a reinforceable mand (e.g., "all situations where objects, materials, or assistance are needed to complete a task or activity") (Michael, 1988).

One reasonable strategy would be to begin by taking a common practical approach to such problems, and define the universe as the range of situations in his/her typical environments where manding will be most likely to be reinforcing for the learner (e.g., snack time in class, free-play recess on the playground, etc.). Such an ecological inventory strategy has often been recommended and applied in curricular planning for persons with severe disabilities (Brown, Branston, Baumgart, Vincent, Falvey, & Schroeder, 1979). An inventory might still result in a very wide range of situations where manding would be functional and appropriate; it may be necessary to begin with a subset of these situations to make initial training manageable. Choosing such subsets is typically based on the frequency with which they are encountered and their potential motivating properties (Stremel-Campbell & Campbell, 1985).

For example, consider a teacher working on developing an initial mand repertoire with a 7 year old female student (Felicia) with severe disabilities in an elementary school setting. An example of an instructional universe might be "food items, objects, and materials during classroom free time, outdoor recess, and lunch periods." Obviously, the universe could be smaller or larger, depending on the inclusion or exclusion of certain contexts or situations, and the types of mands targeted for training (e.g., asking for items or objects vs. other types of question mands [Sundberg, 1987]).

Another universe might be specified for intraverbal responses, which would involve different controlling variables. For example, in teaching thematically-related or classifying responses (Braam & Poling, 1983), a reasonable universe might be "classroom situations (instructional periods, other social interactions) in which Felicia is asked to name: (a) her classmates; (b) things she eats; or, (c) things she plays with."

Defining the Range of Relevant Stimulus and Response Variation

Once the universe if defined, the stimulus and response variability that exists within the universe is determined. This involves identifying the generic stimuli and situations which should set the occasion for the responses to occur, and the range of relevant variability of those stimuli and situations. In addition, variability in responding that may be required or allowed should be documented.

Again, this may be easier with responses or skills that are presumably to be controlled by a more limited set of physical

features (e.g., the size and color of electronic components to be assembled). In considering the complexity and variability of stimuli and establishing operations which control verbal responses it may be more difficult to select the *relevant* variables that should control the response. With regard to external or less private variables, typical approaches have focused on aspects of the persons, settings, and objects/materials to be involved. Variability would include different people, places, and things that are the focus of the interactions. From a verbal behavior and general case perspective, however, such situational characteristics may be relevant *or* irrelevant stimuli (Halle, 1989; Horner, Bellamy, & Colvin, 1984).

This point is illustrated in recent studies by Halle (1989) and Halle and Holt (in press). Halle (1989) trained two students with moderate retardation to label (tact) coins. Training and probe conditions involved different combinations of persons, body positions, times of day, settings, and locations of the coins. When these dimensions were varied one at a time during probe sessions, the students continued to display correct responses as they had in training. Changing more than one dimension simultaneously (e.g., new person and novel setting) disrupted responding for one student but not the other. In a second study, Halle and Holt (in press) trained four students with moderate retardation to request objects from a person during the course of an errand, with the request including the word "please." They assessed the control that had been developed by four stimulus parameters: the person sending the learner on the errand, the person to whom the request was directed, the item, and the location. Probe results indicated that 3 of the 4 learners' responses were controlled by only one or a pair of the stimuli (control was not demonstrated with the fourth learner). These results are an example of the types of undesired control which may develop during training (i.e., typically, a learner should tact or say "please" appropriately regardless of the person with whom they are interacting). Under other circumstances such stimulus dimensions may be relevant (e.g., a learner should not address every female as "Mom"). The general case analysis process would entail making decisions about what are relevant and irrelevant stimulus characteristics.

A related issue mentioned above is that some relevant antecedents may be motivative in nature, and thus more private or less accessible (Michael, 1988). Such aspects may be more difficult to reliably manipulate and include during training conditions; however, the development of procedures mentioned previously for manipulating establishing operations has made this less of a concern. Identifying and incorporating an appropriate range of such motivative variables adds to the complexity of the analysis and programming process for mands in particular, and other verbal relations as well.

Potential variations in response topography also require attention. Training may involve more than one topography of verbal response that will be considered acceptable in given situations. For example, gestures, signs, a particular vocalization, or a short utterance could serve as a mand or tact, as well as responses from the full range of augmentative and alternative communication systems currently being developed and put into use (Mirenda, Iacono, & Williams, 1990). This range of acceptable variability needs to be explicitly documented prior to training (e.g., written down), in order for trainers and other relevant persons to know when and how to appropriately respond to the learner.

Stimulus and response variation for manding. The instructional universe described above included food items and other objects and materials in classroom free time, outdoor recess, and lunch periods. Each of these settings has a wide potential range of variation in stimuli and establishing operations for manding. Potential stimulus variation would include different combinations of physical locations, listeners, foods, utensils, and toys or play materials. Such variation would also include motivative variables, such as the presence

of known reinforcing items which can't be reached, or which may be needed to complete a task or activity. Felicia could mand for a spoon to eat with, for more food or juice while at the lunch table, for a pencil to go with paper during free time, or for a ball on the playground. Relevant to manding, some authors (e.g., Kaczmarek, 1990) have pointed out that it may also be important to consider variation in the presence or attention of listeners. Learners may need to be trained to mand for a listener's attention prior to manding for particular items or other outcomes.

In the present example, the identified range of stimuli and their variation might include: (a) 3 different locations (elementary playground area, classroom free time activity area, and cafeteria) with different characteristics (many or few people around, indoors or outdoors, etc.); (b) 6 different listeners (4 adults and two peers) with different characteristics (male/female, younger/older, etc.); (c) 5-6 typical foods (fruit, crackers, juice, etc.) with different characteristics; (d) 3 utensils (fork, spoon, knife); and, (e) 8-10 toys or play materials (e.g., ball, beanbags, Legos, etc.).

Variation in specific manding responses will depend on the form(s) chosen for training. These might either be topography- or selection-based; that is, a learner might be trained to emit particular vocalizations or signs, or point to words or pictures in a communication book (Michael, 1985; Oah & Dickinson, 1989). Mand responses might be limited to specific items, or might be part of an "I want ____" type of mand frame (Sundberg, 1987). Such decisions will be based in part on learner characteristics and past history (e.g., ability to tact items).

Stimulus and response variation for intraverbal responses. The universe described above included classroom situations where the learner would be asked to name classmates, or things he/she eats or plays with. Major aspects of stimulus variation might include the person providing the verbal stimulus, the specific form of the verbal stimulus, and the physical setting or location. That is, Felicia might be asked "Who is in your class?", "Who do you go to school with," or "Can you tell me who is in your class?", by a variety of different persons (teachers, assistants, visiting parents, etc.). These questions might occur in a variety of locations at different times. So, identified stimuli (with associated variation in their characteristics) might include: (a) 6 different persons (4 adults and 2 peers); (b) 3 different verbal stimulus forms for each category (classmates, things to eat, and things to play with); and, (c) 4 different classroom locations.

Response variation would primarily entail the list of answers that would be considered "thematically acceptable" for different verbal stimuli.

Selecting Examples for Teaching and Testing

The third step requires that examples or situations be chosen from the instructional universe that sample the relevant stimulus variation that has been identified. It has typically been recommended that some examples be chosen for training and some chosen for later probe testing to assess the extent of generalized performance (Horner et al.,, 1982). A variety of guidelines have been developed for selection of examples, and are summarized in Table 2. Some key points are that the full range of stimulus and response variation should be sampled and included in training, and that specific irrelevant stimuli should not be consis-

Table 2
Summary of guidelines for selecting examples for training and testing (adapted from Horner & Albin, 1988; Horner, McDonnell, & Bellamy, 1986; Horner, Sprague, & Wilcox, 1982).

1) Select the Minimum Number of Teaching Examples that Sample the Full Range of Stimulus and Response Variation in the Instructional Universe
2) Select Examples with Equal Amounts of New Information
3) Select Examples that Vary Irrelevant Stimuli
4) Select Examples that Teach the Learner What Not to Do as Well as What to Do
5) Select Examples that Include Significant Exceptions
6) Select Examples that are Logistically Feasible

tently present across all training situations. For example, in teaching street crossing, it would be important to include situations with stoplights, stop signs, and uncontrolled intersections (depending on the identified instructional universe). Irrelevant stimuli, such as whether or not other persons were crossing or not, would need to be varied across training opportunities.

Selecting examples for training manding. Based on the range of variation described above, selected training examples would involve stimuli and establishing operations to set the occasion for manding of food items, utensils, and toys or materials. Each example would involve a combination of the stimuli described above. So, an example situation would be one in which Felicia is seated in the cafeteria across from a female teacher, and has been given a tray with a bowl of soup but no spoon, or a tray with a hot dog but no juice. Another example would be one in which Felicia is out on the playground to play ball with a taller male peer and encounters the ball on a storage shelf out of reach. A third example might involve Felicia seated at the free time table with peers and a male classroom assistant, after having been given paper but no crayons or coloring pens.

It is clear that from the range of stimuli listed above it would be possible to generate numerous examples where manding would be functional and appropriate. As mentioned, it would be important to set up training situations so that inappropriate control does not develop. Felicia should not learn to mand just with Person A in Setting B for Material C, but should rather learn to mand for desired items or outcomes across the range of identified persons, settings, materials, and their different combinations.

Selecting examples for training intraverbal responses. As with manding, different combinations of identified stimulus variation would constitute examples for training intraverbals. Felicia could be presented with verbal stimulus form A ("What are things you eat?") by a classroom assistant while seated at the arts and crafts table. As with manding, the range of identified stimulus variation would be used to generate a variety of training examples which would cut across and combine such variation.

As mentioned above, it is recommended that a second set of examples be chosen which can serve as a probe set after training is completed. This probe set should also reasonably sample the range of relevant variation. This may be more or less difficult to do depending on the range of identified variation. In the above examples, it would be possible to use one or a few instances from each aspect of variation (e.g., persons, materials, settings) as components for post-training probes, or generate additional similar examples to serve as further probes.

Negative teaching examples. The general case process stresses the importance of using negative examples to teach the learner when responding is *not* appropriate, or when some alternative response should be made. Such examples may be very similar or dissimilar to positive examples.

Negative examples for the intraverbal responses described above might include situations such as having the identified persons present verbal stimuli to Felicia that should occasion no response or responses different from the intraverbal responses being trained (e.g., saying "Show me where you eat," as compared to "*What* are things you eat?"). Such negative examples would be maximally similar to the positive training examples. A more dissimilar example might involve Felicia hearing relevant verbal stimuli as part of a conversation between two other people outside the classroom (e.g., a teacher asking similar questions of another student).

Negative examples for manding might include structuring situations where Felicia is able to observe unfamiliar adult persons eating desired food items in close proximity in the cafeteria, or unfamiliar peers playing a ball game on the playground. Manding for the ball or the food items would typically be inappropriate in such circumstances.

Sequencing Teaching Examples

There is some research evidence which suggests that the sequence in which teaching examples are presented influences the resulting generalized performance (Horner et al., 1986). Guidelines for sequencing are summarized in Table 3.

Table 3
Summary of recommendations for sequencing teaching examples (adapted from Horner & Albin, 1988, Horner, McDonnell, & Bellamy, 1986; Horner, Sprague, & Wilcox, 1982).

1) Present Multiple Examples of an Activity Within Individual Teaching Sessions
2) Present Maximally Similar Positive and Negative Examples Right After One Another
3) Periodically Review Examples from Previous Sessions
4) Teach the General Case Before Teaching Exceptions

Recommendations include using multiple examples within single training sessions and presenting maximally similar positive and negative examples right after one another. Such teaching sequences maximize the appropriate discriminations between and among stimulus conditions which may or may not share common features. These recommendations are based on the juxtaposition principles presented by Engelmann and Carnine (1982). For example, the difference principle states that: "To show differences between examples, juxtapose examples that are minimally different and treat the examples differently" (Engelmann & Carnine, 1982, p. 39). Conversely, the sameness principle states: "To show samenesses across examples, juxtapose examples that are greatly different and indicate that the examples have the same label" (Engelmann & Carnine, 1982, p. 39).

For example, it would be possible to set up several consecutive opportunities for Felicia to mand for different food or toy materials with different people during lunch period and an immediately following recess (i.e., showing sameness across different examples). During these periods it would also be possible to intersperse opportunities to observe the above-described negative examples for which manding would not be appropriate (i.e., showing difference across similar examples). For intraverbals, during a teaching session a person could present verbal stimuli for several of the identified categories (food, play things), as well as similar stimuli for other responses, as described above.

Such sequencing recommendations may be somewhat more difficult to follow in the context of the more naturalistic verbal behavior training strategies currently recommended in the field, such as incidental teaching (Goetz & Hunt, 1988; Warren & Bambara, 1989; Warren & Kaiser, 1986). Such approaches capitalize on naturally occurring opportunities that arise in a variety of contexts. However, appropriate attention to setting up and managing relevant settings can maximize the probability that efficient sequences of "natural" training opportunities will occur (Halle, 1982; Hart, 1985; Kaiser et al., 1989). This may be of greater or lesser difficulty depending on the verbal operants being trained. It is relatively easier to present a variety of verbal stimuli which should or should not occasion specific intraverbal responses than it might be to schedule a series of opportunities in which particular mands might occur. Depending on the learner it may prove important to manipulate situations so that enough training opportunities occur, especially initially.

Teaching the Examples

General case instruction does not require new or unusual teaching techniques. General case instruction does differ from more traditional approaches with regard to the teacher behavior described in the above steps and the potential utility of the skills acquired by learners (Horner et al., 1982). The analysis, scheduling, and presentation of teaching situations may require a fair amount of time and effort from teaching personnel (which should be reinforced by the outcomes). Otherwise, instruction should involve the full array of techniques that comprise state-of-the-art instruction (prompting, shaping, fading, reinforcing,

pacing) (Horner, Meyer, & Fredericks, 1986; Snell, 1987). With regard to verbal behavior this would include the various procedures that have been developed and shown to be successful for transferring control of already-established responses to different contingencies (e.g., using echoic or tact prompts to evoke responding and transfer control to mand contingencies [Sundberg, 1987]).

In addition, as mentioned above, full advantage should be taken of the naturalistic training strategies that have been developed over the last decade specifically focused on establishing verbal repertoires in typical settings (Halle, 1982; Haring, Neetz, Lovinger, Peck, & Semmel, 1987; Hart, 1985; Reichle & Keogh, 1986; Warren & Kaiser, 1986).

Testing With Nontrained Probe Examples

Following the achievement of different criterion levels of responding during training, learners can be exposed to the probe set of situations. The major purpose of the probe testing is to obtain information, particularly with regard to problems or errors in responding (e.g., continued responding to irrelevant stimuli). These data can be used to guide modifications in training to deal with such errors (Horner et al., 1982). For example, probe testing may reveal that Felicia produces manding responses in situations with female staff persons, but not with males. Training can then be changed to include more examples and/or more intensive training to try and teach her that those stimulus dimensions are irrelevant. Successful performance in probe situations provides confirmation that appropriate controlling relationships have been established (Halle & Holt, in press), and the general case has indeed been taught. At that point in the process it is important to keep in mind the importance of arranging sufficient review and opportunities to perform the targeted skills (Horner, Williams, & Knobbe, 1985).

FUTURE ISSUES AND DIRECTIONS

The general case process developed and applied by Horner and his colleagues is a blend of powerful behavioral instructional technology and the analysis and programming strategies of Direct Instruction (Engelmann & Carnine, 1982). General case procedures have proven highly effective in establishing a range of community-based skills in learners with severe disabilities. As described above, behavioral approaches have developed a variety of successful strategies for establishing verbal performance across some different stimulus conditions. The general case approach offers a more comprehensive strategy for analyzing and structuring training from its outset to achieve the full range of desired performance. It is exciting to consider the potential of applying such an approach to establishing verbal repertoires within the framework of Skinner's analysis of verbal behavior. There remain, however, a variety of issues to be explored and worked out in clinical research and application (Halle, Chadsey-Rusch, & Collet-Klingenberg, in press; Kaczmarek, 1990).

Development of such applications will dovetail nicely with the current emphasis in the field on functional analyses of communicative functions and teaching alternative responses to replace significant problem behaviors (Carr, 1988; Donnellan, LaVigna, Negri-Shoultz, & Fassbender, 1988; Horner & Billingsley, 1988; Meyer & Evans, 1989; O'Neill, Horner, Albin, Storey, & Sprague, 1990; Steege, Wacker, Berg, Cigrand, & Cooper, 1989). More effective methods of teaching positive alternative behaviors should increase the impact of such strategies. With regard to teaching alternatives to problem behaviors, trainers and researchers will need to attend to aspects such as the relative efficiency of the competing appropriate and problem behaviors (Horner & Billingsley, 1988).

It will be important to determine how the application of general case procedures may differ in approach or difficulty with respect to training different verbal operants (only some of which were considered in this paper). This will involve a variety of

issues discussed above, including strategies for identifying instructional universes, determining what are relevant and irrelevant stimuli and characteristics (including motivative variables), and how to select sets of training and probe situations that sample the range of relevant variation. Another issue concerns the integration of general case analysis procedures with recently developed naturalistic training strategies. As mentioned above, it is possible for teachers and trainers to employ such techniques, but it may require careful attention to structuring and sequencing of settings and situations (Kaiser et al., 1989).

A great deal of progress has been made in the area of establishing verbal repertoires that are used across a variety of settings and situations. The complexity of stimulus control relationships in verbal behavior will present a challenge to further progress. General case programming has promise for increasing the effectiveness of procedures focused on achieving this outcome. The challenge to clinical researchers will be to demonstrate the effectiveness of general case strategies for establishing verbal repertoires, while explaining and packaging them in a fashion that will be understandable and useable by service providers in different settings.

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